

WHAT IS CLAIMED IS:

- 1               1. A method for controlling an industrial process, the method  
2 comprising;  
3               outputting a plurality of parameters from a process for manufacture of a  
4 substance;  
5               using each of the plurality of parameters in a computer aided process, the  
6 computer aided process comparing at least two of the plurality of parameters against a  
7 training set of parameters, the training set of parameters being predetermined;  
8               determining if the at least two of the plurality of parameters are within a  
9 predetermined range of the training set of parameters; and  
10              outputting a result based upon the determining step.
- 1               2. The method of claim 1 wherein the substance is selected from a  
2 petroleum product, a chemical product, a food product, a health product, a cleaning  
3 product, a biological product, and other fluid or objects.
- 1               3. The method of claim 1 wherein the plurality of parameters are  
2 selected from an intrinsic element or an extrinsic element of the process.
- 1               4. The method of claim 1 wherein the using, determining, and  
2 outputting are provided in a computer software program.
- 1               5. The method of claim 1 wherein the computer aided process  
2 includes an algorithm selected from PCA, HCA, KNN CV KNN Prd, SIMCA CV,  
3 SIMCA Prd, Canon Prd, SCREAM, and Fisher CV.
- 1               6. The method of claim 1 further comprising normalizing each of the  
2 plurality of parameters before the using step.
- 1               7. The method of claim 1 further comprising adjusting a base line of  
2 each of the plurality of parameters before the using step.
- 1               8. The method of claim 1 wherein the result is an affirmative response  
2 or a negative response, where the response is displayed on a terminal.

1                   9.     The method of claim 1 wherein the computer aided process is  
2 selected from a library comprising a plurality of processes for performing the comparing  
3 step.

1                   10.    The method of claim 9 wherein the plurality of processes includes  
2 at least a comparing process, a contrasting process, and a functional process.

1                   11.    A method for monitoring an industrial process for the manufacture  
2 of materials, the method comprising:

3                   inputting a plurality of process parameters from a process for manufacture  
4 of a substance;

5                   selecting one of a plurality of computer aided processes, each of the  
6 computer aided processes being capable of determining an output based upon a training  
7 set of the plurality of process parameters;

8                   using each of the plurality of parameters in the selected computer aided  
9 process, the selected computer aided process comparing at least two of the plurality of  
10 process parameters against a training set of parameters;

11                  determining if the at least two of the plurality of process parameters are  
12 within a predetermined range of the training set of parameters; and

13                  outputting a result based upon the determining step.

1                   12.    The method of claim 11 wherein the substance is selected from a  
2 petroleum product, a chemical product, a food product, a health product, a cleaning  
3 product, a biological product, and other fluid or objects.

1                   13.    The method of claim 11 wherein the plurality of process  
2 parameters are selected from an intrinsic element or an extrinsic element of the process.

1                   14.    The method of claim 11 wherein the using, determining, and  
2 outputting are provided in a computer software program.

1                   15.    The method of claim 11 wherein the computer aided process  
2 includes an algorithm selected from PCA, HCA, KNN CV KNN Prd, SIMCA CV,  
3 SIMCA Prd, Canon Prd, SCREAM, and Fisher CV.

1               16.     The method of claim 11 further comprising normalizing each of  
2 the plurality of parameters before the using step.

1               17.     The method of claim 11 further comprising adjusting a base line of  
2 each of the plurality of parameters before the using step.

1               18.     The method of claim 11 wherein the result is an affirmative  
2 response or a negative response, where the response is displayed on a terminal.

1               19.     The method of claim 11 wherein the computer aided process is  
2 selected from a library comprising a plurality of processes for performing the comparing  
3 step.

1               20.     The method of claim 19 wherein the plurality of processes includes  
2 at least a comparing process, a contrasting process, and a functional process.

1               21.     A method for identifying a mode of operation in an industrial  
2 process, the method comprising:

3               running an industrial process, the industrial process being characterized by  
4 a plurality of parameters at an in-process state of a substance or object being  
5 manufactured, each of the parameters defining a characteristic of the substance or the  
6 object in the in-process state;

7               converting each of the parameters into an electronic form;

8               inputting each of the plurality of parameters through a preprocessing  
9 method to increase a signal to noise ratio of one or more of the plurality of parameters,  
10 the preprocessing method being preselected based upon a training set of parameters that  
11 improved the signal to noise ration of the one or more parameters;

12              processing the preprocessed parameters through a computer aided process  
13 to form a descriptor from the preprocessed parameters, the computer aided process being  
14 selected from a plurality of computer aided processes based upon a training set of  
15 parameters;

16              determining if the descriptor is within a selected class from a plurality of  
17 classes; and

18              outputting a result based upon the determining step.

1               22. A method for determining an acceptability of a process, the method  
2 comprising:  
3                identifying a plurality of process parameters from a process for  
4 manufacture of a substance;  
5                using one of the selected computer aided processes out of a plurality of  
6 computer aided processes, the selected computer aided process being derived from a  
7 training set of the plurality of process parameters;  
8                determining an acceptability of the process using each of the plurality of  
9 parameters in the selected computer aided process, the selected computer aided process  
10 comparing at least two of the plurality of process parameters against a training set of  
11 parameters; and  
12               outputting a result based upon the acceptability of the process.

1               23. A method for monitoring a process, the method comprising:  
2                storing a first model in a memory;  
3                acquiring data from a process;  
4                applying the first model to the data to identify a first predicted descriptor  
5 characteristic of a state of the process; and  
6                consulting a first knowledge based system to provide an output based upon  
7 the first predicted descriptor.

1               24. The method of claim 23 wherein the model is constructed from a  
2 mathematical equation describing a physical law.

1               25. The method of claim 23 further comprising preprocessing the data  
2 prior to applying the model.

1               26. The method of claim 23 wherein the output is communicated to  
2 control the process by adjusting an operational parameter of the process.

1               27. The method of claim 23 wherein the output is communicated to a  
2 human operator to permit monitoring of the process.

1               28. The method of claim 23 wherein the output is resident on a server  
2 and accessible to a user through a browser software program.

1               29.     The method of claim 28 wherein the input is acquired from the  
2 process over a network of computers

1               30.     The method of claim 23 wherein the input is acquired from the  
2 process over a network of computers..

1               31.     The method of claim 23 wherein the output is communicated over  
2 a network to an associated system, the associated system including at least one of a legacy  
3 system, an e-enterprise system, and a desktop application.

1               32.     The method of claim 23 wherein the first knowledge based system  
2 is an expert system.

1               33.     The method of claim 23 further comprising:  
2               acquiring initial data from a source at a first time;  
3               converting the initial data into electronic form;  
4               loading the initial data into memory;  
5               retrieving the initial data from memory;  
6               acquiring subsequent data from the source at a second time;  
7               assigning a first descriptor to the initial data and a second descriptor to the  
8 subsequent data;  
9               constructing the model based upon the initial data, the subsequent data, the  
10 first descriptor, and the second descriptor; and  
11              storing the model in memory.

1               34.     The method of claim 33 wherein the model is constructed from one  
2 of a univariate statistical technique, a multivariate statistical technique, a neural-based  
3 approach, and a time series analysis.

1               35.     The method of claim 33 wherein the model is constructed from one  
2 of a group of different algorithms stored in a library.

1               36.     The method of claim 33 wherein the source is in communication  
2 with the process, the initial data and the subsequent data reflecting prior operation of the  
3 process.

1               37.     The method of claim 33 wherein the source is in communication  
2 with a second process similar to the process, the initial data and the subsequent data  
3 reflecting operation of the second process.

1               38.     The method of claim 33 further comprising:  
2                      constructing a second model;  
3                      storing the second model in memory;  
4                      applying the second model to the process data to identify a second  
5 predicted descriptor characteristic of the process data; and  
6                      consulting the first knowledge based system to produce the output based  
7 upon the first predicted descriptor and the second predicted descriptor.

1               39.     The method of claim 38 wherein the second model is constructed  
2 based upon the initial data, the subsequent data, the first descriptor, and the second  
3 descriptor, such that comparison of the first descriptor and the second descriptor  
4 represents a cross-validation.

1               40.     The method of claim 38 wherein the second model is constructed  
2 from operation of a second process similar to the process, such that comparison of the  
3 first descriptor to the second descriptor represents an external validation..

1               41.     The method of claim 38 wherein the knowledge based system is an  
2 expert system.

1               42.     The method of claim 38 wherein a difference between the first  
2 predicted descriptor and the second predicted descriptor is resolved by a second expert  
3 system.

1               43.     The method of claim 23 further comprising receiving key preliminary  
2 information and communicating the key preliminary information downstream to the first  
3 model, such that the first predicted descriptor reflects the key preliminary information.